MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 2, 2018/2019

PPC0116 – PRE-CALCULUS

(All sections / Groups)

4 MARCH 2019
2.30 p.m. - 4.30 p.m.
(2 Hours)

INSTRUCTIONS TO STUDENTS

1. This question paper consists of 3 pages with 4 questions.
2. Answer all questions.
3. Unless stated otherwise, if an answer is given as a decimal, it should be rounded to **four** significant figures.
4. Write your answers in the Answer Booklet provided.
5. Show all relevant working.

Question 1

(a) The (gross) price of a car is RM 33750. This total includes the following:

- the net sales price of the car,
- Tax A of 10%,
- Tax B which is *a quarter* of Tax A.

What was the net sales price of the car before addition of the taxes?

[5 marks]

(b) Solve the following equation by rearranging and **completing the square**:

$$x = \frac{2x^2 - x + 7}{3x + 5}.$$

[7 marks]

(c) The following radical equation is given:

$$\sqrt{3x - 5} - \sqrt{x + 7} = 2.$$

(i) **Simplify** (but do not solve) the equation to eliminate the radicals. Write your answer in the form $ax^2 + bx + c = 0$. [6 marks]

(ii) **Without solving**, determine the nature of the possible solutions (i.e., two distinct real solutions, one repeated real solution or two complex solutions).

[3 marks]

(iii) Solve the equation using the quadratic formula and identify the extraneous solution, if any. [4 marks]

Question 2

(a) Given $f(x) = \sqrt{x}$ and $g(x) = \frac{x^2+1}{x}$, $x > 0$:

(i) Find $(g \circ f)(x)$. [2 marks]

(ii) Determine the inverse of f, i.e., f^{-1} and verify that $f^{-1}[(f(x)] = x$.

[2 + 2 marks]

(b) Solve the inequality $\frac{(x+1)}{(x+3)} \leq 2$. Derive your solution using the real number line.

[7 + 2 marks]

(c) Given the polynomial function $f(x) = 4(x + 1)(x - 2)^3$:

(i) Find its x- and y-intercepts, if any. [3 marks]

(ii) At each x-intercept, determine whether the graph touches or crosses the x-axis. [2 marks]

(iii) What is the maximum number of turning points for f? [1 mark]

Continued...

(iv) Hence, sketch the graph of f. [4 marks]

Question 3

(a) David has taken an initial dose of prescription medication. The relationship between the elapsed time t (in hours) and the amount $M(t)$, in milligrams (mg), in his bloodstream is modelled by the following function:

$$M(t) = 20e^{-0.8t}.$$

In how many hours will David have only 1 mg of medication remaining in his bloodstream? [4 marks]

(b) Solve for x if $log_2(x^2 - x) = 1$. [5 marks]

(c) Express the following series in summation notation (do not find the sum):

$$\frac{5}{2} + \frac{5^2}{3} + \frac{5^3}{4} + \cdots + \frac{5^{10}}{11}.$$

[3 marks]

(d) A dampened oscillator starts off at 100 oscillations per second. Every second after that, it makes 7/8 as many vibrations as the previous second. How many oscillations would it have completed before coming to a stop? [7 marks]

(e) Expand $(2x - 1)^4$ using the binomial theorem. [6 marks]

Question 4

(a) Solve the following absolute-value inequality and graph the solution set on the real number line:

$$|2x - 6| > 4.$$

[5+2 marks]

(b) The polynomial function $f(x) = 2x^3 + 2x^2 - x - 1$ has one rational root.

(i) Using the **rational root theorem**, find all possible candidates for that root. [5 marks]

(ii) Show that $x = -1$ is the correct root. [2 marks]

(iii) $f(x)$ is divided by $x+1$. Based on (ii), what is the remainder? [2 marks]

(c) Find the partial fraction decomposition of

$$f(x) = \frac{x - 1}{(x + 2)^2}.$$

[9 marks]

End of Paper